

Precipitation—Continued.

Stations.	November, 1898.	December, 1898.	January, 1899.	February, 1899.	March, 1899.	April, 1899.	Normal an- nual.
Lake Erie Basin—Continued.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Hillhouse, Ohio.....	4.32	3.72	2.84	2.82	4.22	1.17	.....
Perry, Ohio.....	4.30	2.40	2.82	2.51	3.64	1.20	.....
Ashtabula, Ohio.....	4.15	4.64	3.12	3.80	4.90	.....	.....
Erie, Pa.....	3.58	2.84	1.50	1.44	3.08	1.08	41.28
Franklin, Pa.....	3.89	1.81	.....	.....	4.19	1.06	.....
Westfield, N. Y.....	3.85	3.29	1.23	1.35	2.98	1.01	.....
Arcade, N. Y.....	3.79	3.15	2.22	1.49	2.41	1.04	.....
Buffalo, N. Y.....	3.98	3.52	2.98	1.62	3.03	1.02	38.04
Niagara Falls, N. Y.....	3.00	3.03	1.76	1.40	2.27	.....	.....
Lake Ontario Basin.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Alton, Ont.....	2.46	2.80	1.73	1.85	.....	.....	31.05
Hamilton, Ont.....	2.58	1.56	2.12	1.19	3.74	1.42	.....
Stony Creek, Ont.....	3.81	3.57	2.97	1.86	6.19	1.24	.....
Niagara, Ont.....	2.79	2.68	1.81	2.85	3.52	1.23	.....
Welland, Ont.....	3.38	4.82	2.83	2.26	4.47	1.39	37.18
Toronto, Ont.....	3.01	2.55	2.87	1.73	4.23	1.62	30.75
Stouffville, Ont.....	2.72	3.83	3.78	1.79	5.42	2.98	.....
Millbrook, Ont.....	3.40	2.90	3.60	2.15	3.70	1.50	.....
Port Hope, Ont.....	3.81	2.22	4.50	1.75	4.05	1.51	.....
Peterboro, Ont.....	1.65	2.97	4.50	1.47	5.09	1.24	30.98
Lindsay, Ont.....	1.98	2.65	3.17	1.69	4.15	1.80	.....
Haliburton, Ont.....	2.84	3.01	3.40	1.15	3.79	1.04	.....
Deseronto, Ont.....	3.90	2.36	3.61	1.23	2.76	1.79	.....
Bloomfield, Ont.....	2.24	1.74	2.45	1.69	2.66	1.51	.....
Kingston, Ont.....	1.26	1.68	2.15	1.22	3.43	1.07	33.94
Ottawa, Ont.....	1.42	3.10	2.16	0.89	5.68	1.08	33.63
Montreal, Ont.....	2.15	3.20	4.62	1.63	8.58	1.39	38.81
Ridgeway, N. Y.....	3.20	2.34	1.52	1.98	2.50	1.25	.....
Rochester, N. Y.....	3.54	3.01	2.54	2.28	3.47	1.66	34.82
Aron, N. Y.....	2.72	1.33	0.81	0.80	1.33	1.39	.....
Mount Morris, N. Y.....	1.74	1.60	1.20	0.65	1.40	.....	.....
Nunda, N. Y.....	3.63	2.33	1.61	1.98	2.86	2.35	.....
Wedgwood, N. Y.....	2.73	1.92	1.72	2.07	2.90	1.03	.....
Itasca, N. Y.....	3.15	2.22	1.67	1.43	2.46	1.45	32.72
Penn Yan, N. Y.....	2.63	2.15	1.70	1.29	2.33	1.27	28.70
Romulus, N. Y.....	4.48	2.01	1.24	1.00	2.35	0.59	.....
Fleming, N. Y.....	2.21	1.80	0.40	.....	.....	1.04	.....
Sherwood, N. Y.....	2.48	1.87	1.04	1.21	2.14	.....	.....
Auburn, N. Y.....	3.65	2.50	1.80	1.61	3.20	1.70	.....
Lyons, N. Y.....	3.00	1.94	0.92	1.25	2.24	1.46	.....
Baldwinsville, N. Y.....	3.31	3.13	1.83	1.67	4.40	1.90	.....
Skaneateles, N. Y.....	3.95	3.12	1.80	1.35	3.05	1.82	.....
Fayetteville, N. Y.....	3.25	2.15	0.98	1.62	3.65	.....	.....
Phenix, N. Y.....	2.80	3.28	1.52	3.41	5.08	2.09	.....
Fulton, N. Y.....	3.06	1.33	1.28	1.80	3.04	1.79	.....
Oswego, N. Y.....	3.32	3.25	2.73	2.74	4.56	1.69	35.02
Palermo, N. Y.....	3.25	2.25	1.58	1.44	2.38	1.32	.....
Adams, N. Y.....	3.14	4.04	3.58	1.95	4.61	1.20	.....
Lowville, N. Y.....	3.41	4.54	3.64	2.80	5.11	2.01	.....
Madison Barracks, N. Y.....	.....	2.40	1.60	0.70	2.70	.....	.....
Watertown, N. Y.....	3.02	5.65	3.86	2.21	5.21	2.76	.....
Number Four, N. Y.....	3.49	7.44	4.58	2.70	5.45	2.15	.....

OBSERVATIONS AT RIVAS, NICARAGUA.

The records contributed for many years by Dr. Earl Flint, at Rivas, Nicaragua, include barometric readings. His present station is at 11° 26' N., 85° 47' W. The observations at 7:17 a. m., local time, are simultaneous with Greenwich 1 p. m. The altitude of his barometer is 36 meters above sea level, but until the barometer has been compared with a standard it seems hardly necessary to publish the daily readings. The wind force is recorded on the Beaufort scale, 0-12. When cloudiness is less than $\frac{1}{10}$, the letter "F" or "Few," is recorded.

This station is situated on the western shore of Lake Nicaragua, not far from the eastern end of the western division of the Nicaragua Canal. The volcano Ometepe, on an island in Lake Nicaragua, is about 10 miles northeast of the station. Mr. Flint's records occasionally mention the presence of clouds on the summit of this mountain.

Observations at Rivas, Nicaragua, March, 1899.

OBSERVATIONS AT 7:17 A. M. LOCAL (8 A. M. EASTERN STANDARD) TIME.

Date.	Tempera- ture.		Wind.		Upper clouds.		Lower clouds.		Daily rainfall.
	Air.	Dew-point.	Direction.	Force.	Kind.	Amount.	Direction from.	Kind.	
1.....	78	73	ne.	1	.....	.....	.....	f.k.*	9
2.....	74	71	ne.	2	.....	.....	.....	Few	10
3.....	76	71	ne.	2	.....	.....	.....	.....	.....

Observations at Rivas, Nicaragua, March, 1899—Continued.

OBSERVATIONS AT 7:17 A. M. LOCAL (8 A. M. EASTERN STANDARD) TIME.

Date.	Tempera- ture.		Wind.		Upper clouds.			Lower Clouds.			Daily rainfall.
	Air.	Dew-point.	Direction.	Force.	Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.	
4.....	75	69	e.	1	.....	.....	.....	k.	1	e.	T.
5.....	75	71	e.	2	.....	.....	.....	ak.	Few	e.	0.00
6.....	76	71	ne.	2	.....	.....	.....	ak.	9	ne.	T.
7.....	75	70	ne.	2	.....	.....	.....	k.	Few	ne.	0.05
8.....	74	68	ne.	2	.....	.....	.....	f.k.	3	ne.	0.00
9.....	74.5	68	ne.	2	.....	.....	.....	f.k.	9	ne.	0.00
10.....	74.5	67	ne.	4	as.	1	sw.	ks.	10	ne.	0.00
11.....	75.5	68	ne.	4	.....	.....	.....	ks.*	Few	ne.	0.00
12.....	76	70	ne.	3	.....	.....	.....	ks.	10	ne.	0.00
13.....	78	72	ne.	3	.....	.....	.....	k.	4	ne.	0.00
14.....	77	72	ne.	3	.....	.....	.....	k.	1	ne.	0.00
15.....	77	73	ne.	2	.....	.....	.....	k.	5	ne.	0.00
16.....	78	72	ne.	4	.....	.....	.....	k.	Few	ne.	0.00
17.....	77	72	ne.	2	.....	.....	.....	k.	Few	ne.	0.00
18.....	76	70	ne.	3	.....	.....	.....	f.k.	5	ne.	0.00
19.....	74	71	sw.	0	.....	.....	.....	ak.	3	sw.	0.00
20.....	77	73	ne.	0	ck.	10	sw.	.....	.....	.....	0.00
21.....	77	70	ne.	1	cs.	1	se.	k.	4	ne.	0.00
22.....	78	72	ne.	5	cs.	1	.....	k.	2	sw.	0.00
23.....	76.5	70	ne.	1	.....	.....	.....	ks.*	Few	ne.	0.00
24.....	77	71	ne.	1	.....	.....	.....	k.	3	ne.	0.00
25.....	77.5	71	ne.	1	cs.	9	sw.	k.	1	ne.	0.00
26.....	77	70	e.	2	cs.	1	sw.	k.	9	e.	0.00
27.....	77.5	72	ne.	2	.....	.....	.....	k.	10	ne.	0.00
28.....	78.5	71	e.	2	.....	.....	.....	k.	1	e.	0.00
29.....	77.5	72	ne.	2	.....	.....	.....	k.	10	ne.	0.00
30.....	79	73	e.	2	.....	.....	.....	k.	7	e.	0.09
31.....	73.5	72	ne.	3	.....	.....	.....	ak.	10	ne.	0.51
Sums.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.65
Means.....	76.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* On Ometepe.

OBSERVATIONS AT 8 P. M. SEVENTY-FIFTH (8:17 P. M. LOCAL) TIME.

Date.	Tempera- ture.		Wind.		Upper clouds.			Lower clouds.		
	Air.	Dew-point.	Direction.	Force.	Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.
1.....	78	73	se.	1	.....	0	.....	.....	0	.....
2.....	73	71	ne.	2	.....	0	.....	k.	Few	0
3.....	73	72	se.	2	.....	0	.....	.....	0	.....
4.....	73	73	se.	2	.....	0	.....	.....	0	.....
5.....	73	73	se.	2	.....	0	.....	.....	0	.....
6.....	73	73	se.	2	.....	0	.....	.....	0	.....
7.....	73	73	se.	2	.....	0	.....	.....	0	.....
8.....	75.5	68	ne.	5-6	ck.	Few	ne.	.....	.....	.....
9.....	73	71	ne.	3-4	ck.	Few	sw.	.....	.....	.....
10.....	73.5	70	ne.	3-4	ck.	Few	sw.	.....	.....	.....
11.....	73.5	71	ne.	3-4	ck.	Few	sw.	.....	.....	.....
12.....	73	71	ne.	3-4	ck.	Few	sw.	.....	.....	.....
13.....	73	72	ne.	3-4	ck.	0	.....	.....	.....	.....
14.....	81	72	ne.	3-4	ck.	0	.....	.....	.....	.....
15.....	81	74	ne.	3-4	ck.	0	.....	.....	.....	.....
16.....	80.5	73	ne.	3-4	ck.	0	.....	.....	.....	.....
17.....	79.5	73	ne.	3-4	ck.	0	.....	.....	.....	.....
18.....	77	73	ne.	3-4	ck.	0	.....	.....	.....	.....
19.....	77	73	sw.	1	ck.	10	sw.	.....	.....	.....
20.....	80.5	73	ne.	3-4	ck.	.....	sw.	.....	.....	.....
21.....	80.5	73	ne.	3-4	ck.	.....	sw.	.....	.....	.....
22.....	80	73	ne.	3-4	ck.	.....	sw.	.....	.....	.....
23.....	80	73	ne.	3-4	ck.	0	sw.	.....	.....	.....
24.....	80.5	73	ne.	3-4	ck.	.....	sw.	.....	.....	.....
25.....	81	73	se.	3-4	ck.	.....	.....	.....	.....	.....
26.....	80	73	se.	3-4	ck.	.....	.....	.....	.....	.....
27.....	81.5	73	ne.	4-4	ck.	3	e.	.....	.....	.....
28.....	80	74	ne.	4-4	ck.	10	ne.	.....	.....	.....
29.....	82	75	se.	4-4	ck.	2	se.	.....	.....	.....
30.....	81	76	se.	4-4	ck.	.....	.....	.....	.....	.....
31.....	77.5	73	e.	2	.....	.....	.....	k.	5	se.
Means.....	79.1	.....	.....	.....	.....	.....	.....	.....	10	e.

* On Ometepe.

6th, 8 p. m., wind increasing; 7th, gale after 9 p. m.; 8th, barometer at 29.86, gale continues; sprinkling 3 p. m.; 8th, p. m. coffee injured; 9th, 2 a. m., gale moderating; 12th, earthquake 4:18:47 a. m., northwest to southeast, occurred at Leon, Managua, Granada, and San Juan del Sur.

TEXT BOOKS ON BOTANY.

By FREDERICK V. COVILLE, Chief of Division of Botany, U. S. Department of Agriculture.

In response to a request by the Chief of the Weather Bureau, Mr. F. V. Coville, Chief of the Division of Botany, communicates the following suggestions:

With reference to books on botany, suitable for Weather Bureau observers, I would suggest that their interest in botany is likely to follow one of two lines: 1st. Physiological botany with special reference to agricultural crops and soils. 2d. Systematic botany with special reference to their local flora.

Among the various books on physiological botany I would recommend as best for this purpose one entitled *A Text-book of Botany*, translated from the German of Strasburger, Knoll, Schneck, and Schimper, which is published by MacMillan & Co., New York, at \$4.50. Another book, which though not primarily a publication on physiological botany, but nevertheless one of the highest utility in this line, is the three-volume, seventh edition of Storer's *Agriculture in some of its Relations with Chemistry*, published in New York, at about \$5. This is a book of the same character as Johnson's *How Crops Feed*, but covers the ground much more comprehensively, and brings the information authoritatively

up to date. In the matter of systematic botany I would recommend, as a preliminary text book for the learning of terminology and morphology, Gray's *Lessons in Botany*, published in New York, at \$1.10, and L. H. Bailey's *Lessons with Plants*, published by MacMillan & Co., at \$1.10. After going through either or both of these, the student will be in a position to use the various local floras as follows:

Northeastern United States: Gray's *Manual of Botany*, or Britton & Brown's *Illustrated Flora*, the latter published by Charles Scribner's Sons, in three volumes, at \$3 per volume.

Southern States: Chapman's *Flora of the Southern States*, published by the Cambridge Botanical Supply Company, Cambridge, Mass., at \$4. (Third edition.)

For the Rocky Mountains: Coulter's *Manual of Rocky Mountain Botany*, which may be secured at a cost of \$1.85.

For Texas: Coulter's *Botany of Western Texas*, published by the Division of Botany, U. S. Department of Agriculture, at 35 cents.

For California: Greene's *Manual of Bay Region Botany*, published by the author, at \$2. Brewer and Watson's *Botany of California*, issued in two volumes, published at Cambridge, Mass., at about \$10.

For the Pacific Northwest: *Flora of Northwest America*, of which about one-third has been published, and can be secured of Mr. M. W. Gorman, No. 75 Fourteenth street, North Portland, Oregon, at about 50 cents.

NOTES BY THE EDITOR.

PAMPEROS AND CYCLONIC STORMS.

The Pilot Chart of the North Pacific Ocean for June, 1899, contains a short article on a cyclonic storm at the mouth of the Rio de la Plata, October 20, 1897. By collecting the reports from several vessels and land stations, the author of this article has been able to draw a system of approximate isobars and winds for 10 a. m., October 20. This again illustrates the good work referred to in the MONTHLY WEATHER REVIEW for March, page 114, that can be done by the utilization of the great mass of material that is steadily accumulating in the archives of national hydrographic and admiralty offices. Many years ago large collections of manuscript log books were destroyed for lack of storage room. They represented the best work of navigators in sailing vessels on all parts of the ocean. Now that the tracks of steamers are so direct, it is questionable whether we shall ever again be able to accumulate ocean data in sufficient quantity to trace storm paths in the unfrequented portions of the ocean. And yet meteorology can not be properly studied without a daily weather map of the ocean as well as of the land. We must, therefore, hope that, both by individual and by combined efforts, the navigators and hydrographers will come to the assistance of the meteorologists and devise some method for the publication of the best daily weather chart that it is possible to compile in the present state of navigation. The Editor kept up such a daily chart to the end of 1895, for the most frequented portions of the north Atlantic Ocean; and it seems certain that a great chart of the Atlantic, like that for the year 1882, published by the London Meteorological Office, if continued for only ten or fifteen years, and even if published in only very limited numbers, would be a boon to the student of meteorology.

The Pilot Chart says:

The 20th of October, 1897, was marked by the occurrence, in the vicinity of the mouth of the Rio de la Plata, of a severe storm of the pampero type. This storm was due to the passage over Montevideo of a well-developed area of low pressure, which had its origin in the interior of the continent to the westward. At Rosario the pressure began to diminish at noon of October 17, reached its lowest point at 6 a. m., October 19, and had recovered somewhat at 10 a. m., October 20, when the pressure had risen to 29.54 inches, and the chart represents the condition of affairs at this time. Owing to the lack of observers, it is impossible to trace the progress of the storm center eastward after leaving the coast, but its effects were felt two days later by three vessels, which were at that time 25° in longitude east of Montevideo. Two well-marked types of the pampero may be distinguished, both

associated with areas of low barometric pressure: 1. The summer pampero, locally known as "turbanado," which may be described as a brief but violent thunderstorm, sometimes, indeed, of extraordinary violence. 2. The winter pampero or true wind from the pampas, the cold south-westerly gale which blows in the rear of the eastward-moving barometric depressions, varying in duration from a few hours to several days, and showing a close analogy to the "norther" of the Gulf of Mexico. The former type prevails during the period October to March, the latter from April to September, although the seasonal differences throughout these regions are not sufficiently pronounced to give a decided preponderance to either variety. During the spring months, October and November, this being the season of maximum frequency of pamperos, the number of each occurring is about the same.

The mariner sailing these waters should always be on his guard against the occurrence of these storms, for although their violence has been to some extent exaggerated, the winds rarely attaining full hurricane force, yet the frequent extreme abruptness of the shift from north to southwest, and rapid increase of wind, often renders measures of safety impossible, if delayed too long. The signs of the approach of the pampero are almost unmistakable. The storm is primarily due to the approach and passage of an area of low barometer, around which the winds circulate in a right-handed direction, or against the sun, at the same time drawing inward toward the center. The front or eastern half of the storm is therefore marked by falling barometer, rising temperature, warm northerly or northeasterly winds, and sky becoming gradually overcast with passing showers of fine rain. These conditions may prevail from one to three days. As the center or trough of the storm approaches, heavy cumulo-nimbus clouds gather in the southwest, quickly approaching and darkening the whole atmosphere. Flashes of lightning of startling brilliancy are also a frequent, although not an invariable feature of this period of the storm. The northerly winds continue to flow until the falling barometer becomes almost stationary, when a brief period of calm ensues, often accompanied, as in the present case, by a temporary partial clearing of the sky. The lull, however, is of short duration. Suddenly the pampero breaks with a squall of almost hurricane force from southwest, the barometer starts to rise, the rain ceases in a series of heavy showers, and the gale blows itself out from this quarter as the depression moves off to the eastward.

SPOOL KITES AND KITES WITH RADIAL WINGS.

At the recent meeting in Washington of the National Academy of Sciences Prof. Alexander Graham Bell described a number of experiments recently made by him with both the Hargrave and other forms of kites. The Hargrave kite of the style called by him the great Hargrave kite, was completed September 1, 1898, at his laboratory at Beim Breagh, N. S. It is about 11 feet long, 8 feet broad, and 4 feet deep, and consists of two of the regular Hargrave cells, 4 by 4 by 8, separated by a space of 3 feet. The "manhole" kite was